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## TREE GROWTH AND CLIMATE

A. E. DOUGLASS. **Climatic Cycles and Tree-Growth: A Study of the Annual Rings of Trees in Relation to Climate and Solar Activity.** 127 pp.; diags., ills., bibliogr. *Carnegie Instn. Publ. No. 289.* Washington, D. C., 1919. 10 x 7 inches.

In 1901 Professor Douglass began a study of tree growth which bids fair to be one of the most fruitful sources of information as to climate. His method, which is already widely known, consists of measuring the width of the annual rings of growth and thereby determining the climatic conditions. Beginning with the pine trees near Flagstaff Observatory in Arizona, where he was then at work, he has carried his observations to the Pacific and to the Atlantic coasts, and to many countries of Europe.

In the present volume Professor Douglass sums up all his work to date (compare the abstract on p. 190 of this *Review*). He rightly devotes much space to a careful description of the methods which he has gradually evolved. How delicate those methods are may be judged from his ability to identify rings of growth. Even if he knows nothing as to the date of a piece of wood he can assign each ring to its proper year, provided he knows where the tree grew and has other trees of known age and the same species with which to compare it. He does this by a minute study of the relative thickness and general characteristics of adjacent groups of rings. It seems almost incredible that such high accuracy is possible, but there can be no doubt that the method is successful. In this way he has checked up the reviewer's long series of measurements of the sequoias in California and has found that in spite of minor errors the general curve of climatic pulsations derived from a study of the big trees is correct.

Other parts of Professor Douglass' book are devoted to the correlation of the tree curves with the rainfall and with sun spots, and to a study of cycles. In addition, an important section describes methods of "periodic analysis." By the means of a periodograph of his own invention the author is able to analyze any sort of curve and find what periodicities it shows. This is done by photographing the plotted curve through a fine grating. If there is no periodicity the photograph assumes a hazy or dotted appearance. If there are periodicities, a series of parallel lines appears.

The chief results of Professor Douglass' work may be summed up as follows:

(1) He has developed a unique method and a highly perfect technique for the study of tree growth.

(2) He has shown conclusively that there is a close relation between the thickness of the rings of growth and the climate. This relation varies greatly from region to region, but the relationship can readily be worked out if sufficient data are at hand.

(3) He has shown that the tree records covering centuries agree with meteorological records covering decades in showing that the rainfall of different regions varies in opposite directions. This may happen even when places are only a few hundred miles apart, as on the eastern and western sides of the Scandinavian Peninsula.

(4) Professor Douglass has also shown that many of the curves of tree growth show a distinct correlation with changes in the number of sun spots. This is particularly marked in central and northwestern Europe.

(5) He finds a great number of cycles which he tabulates as follows:

5 to	6 years,	approximate half	sunspot period
10 "	13 "	" full	" "
21 "	24 "	" double	" "
32 "	35 "	" triple	" "
100 "	105 "	" triple-triple	" "

The chief criticism of Professor Douglass' work is that he perhaps overestimates the regularity of cycles. There can be no question as to the existence of cycles and as to their importance. To the reviewer, however, the cycles seem to be so irregular that it may be doubtful whether we are justified in assigning any exact periodicity.

ELLSWORTH HUNTINGTON

## THE OFFICIAL YEAR BOOK OF AUSTRALIA

G. H. KNIBBS. **Official Year Book of the Commonwealth of Australia, Containing Authoritative Statistics for the Period 1901-1918 and Corrected Statistics for the Period 1788 to 1900.** No. 12, 1919. xxxviii and 1234 pp.; maps, diags., index. Commonwealth Bureau of Census and Statistics, Melbourne, 1919. 9½ x 6½ inches.

The practice of the Commonwealth governments of Australia and New Zealand of publishing official yearbooks in which the current results of a number of government bureaus are recorded gives these publications a special value to the investigator. In the case of Australia the Bureau of Census and Statistics is the coördinating agency. In its latest pub-

lication, that for 1919, statistics for the period 1788-1900 are revised and those since 1900 are brought down, in authoritative form, to include 1918. Thus there is a complete statement of Australia's activities in the war and a statistical summary, graphically illustrated, of the relative cost of food, groceries, and house rent in relation to distribution of population for the years 1913 to 1918 inclusive. The latest irrigation developments are treated in detail. In fact, practically every aspect of Australian life in which a geographer might be interested is described or analyzed or illustrated by statistics or graphs. It may be noted in passing that the American Geographical Society has for several years given considerable attention to completing its collection of yearbooks owing to the growing value of many of them in scientific research.

The Australian yearbook for 1919 contains an orographical map of the Commonwealth that deserves special mention. Since 1903 the Weather Bureau has been collecting appropriate data for the map, and these have now been assembled and supplemented, and the contours redrawn, by Dr. Griffith Taylor, Commonwealth Physiographer and now also Professor of Geography at Sydney University. For much of the area the contours are only form lines sketched between stations of known height. For the rest the contours represent surveys of moderate detail. The result is that we have a general assembly of most diverse data but the whole so critically treated according to accepted cartographical principles as to make a real contribution to knowledge.

The map is in eight altitude tints separated by 0, 500, 1,000, 2,000, 3,000, 4,000, and 5,000 feet; and there is a separate shading for the land below sea level principally on the eastern and southern margins of the Lake Eyre depression, the surface of the lake being 39 feet below sea level.

This number of the yearbook also includes a specially contributed article, "The Plains and Peneplains of Australia," by E. C. Andrews.

#### A CENTENNIAL OF AMERICAN SCIENCE

E. S. DANA AND OTHERS. Edits. **A Century of Science in America, with Special Reference to the American Journal of Science, 1818-1918.** (Mrs. Hepsa Ely Silliman Memorial Lectures, Vol. 14.) 458 pp.; diags., ills., bibliogr. Yale Univ. Press, New Haven, 1918. \$4. 9 x 6 inches.

Among the thirteen chapters in this book, Chapter 3, written by Professor H. E. Gregory, of Yale University, is of interest to geographical students as a brief history of progress in the interpretation of land forms. In addition to many valuable sidelights on the history of the development of physiographical thought the chapter contains a useful bibliography of seventy-three titles, covering nearly all phases of the science.